

CLAIMS

1. In a multidimensional digital frame structure, a method for variably programming the value of frame synchronization bytes, the method comprising:

- 5 defining a frame with an overhead section having a predetermined number of bytes; and
- selecting the values of the bytes in the overhead section to be used for frame synchronization.

- 10 2. The method of claim 1 wherein defining the frame includes defining the overhead section having a first plurality of overhead byte locations; and

 wherein selecting the value of the frame synchronization bytes in the overhead section includes selecting values in the range from
15 zero to a first plurality of byte values.

3. The method of claim 2 wherein defining a frame includes defining each frame synchronization byte having a second plurality of bits; and

20 wherein selecting the value of the frame synchronization bytes includes selecting a second plurality of bits for each frame synchronization byte.

4. The method of claim 3 wherein selecting the value of
25 frame synchronization bytes in the overhead section includes selecting a plurality of frame synchronization byte values.

5. The method of claim 4 wherein selecting frame synchronization byte values includes selecting frame synchronization bytes having a first value and frame synchronization bytes having a second value.

6. The method of claim 2 further comprising:
selecting the quantity of bytes in the overhead section to be used for frame synchronization.

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7. The method of claim 6 wherein defining the frame includes defining the overhead section having a first plurality of bytes;
wherein selecting the quantity of bytes in the overhead section includes selecting a first number of bytes in the range from zero to the first plurality of bytes; and

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wherein selecting the value of the frame synchronization bytes in the overhead section includes selecting a first number of byte values.

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8. The method of claim 2 further comprising:
defining a superframe structure with a predetermined number of frames per superframe; and
wherein selecting the values of frame synchronization bytes in the overhead section includes selecting the values of bytes in the overhead section of each frame.

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9. The method of claim 8 wherein defining a superframe structure with a predetermined number of frames per superframe includes defining a first and a second frame in the superframe; and

wherein selecting the values of frame synchronization bytes in the overhead section includes selecting a first byte value in the first frame and a second byte value in the second frame.

10. The method of claim 9 wherein defining a superframe structure with a predetermined number of frames per superframe includes defining a superframe with a first, second, third, and fourth frame; and

wherein selecting the values of frame synchronization bytes in the overhead section includes selecting a first byte value in the first frame, a second byte value in the second frame, a third byte value in the third frame, and a fourth byte value in the fourth frame.

11. The method of claim 10 wherein selecting the values of frame synchronization bytes in the overhead section includes selecting a value of zero in the second, third, and fourth frames.

12. The method of claim 2 further comprising:
selecting the bit error rate of the frame synchronization byte values.

13. The method of claim 12 wherein selecting a frame synchronization byte bit error rate includes selecting an average bit error rate for the selected frame synchronization byte values.

5 14. The method of claim 12 wherein selecting the frame synchronization byte values includes selecting a frame synchronization value with a selected bit error rate.

15. The method of claim 2 further comprising:
10 selecting the location of the frame synchronization bytes in the overhead section.

16. The method of claim 15 wherein selecting the location of frame synchronization byte includes selecting frame synchronization
15 bytes having a first value, in a first location, and frame synchronization bytes having a second value, in a second location.

17. The method of claim 15 wherein selecting the frame synchronization byte includes selecting a first frame synchronization byte
20 value at a first location.

18. A method for variably programming the value of frame synchronization bytes in the communication of a multidimensional digital frame structure, the method comprising:
25 selecting the values of frame synchronization bytes in the overhead section of a transmitted frame;

sending the frame;
receiving the frame; and
synchronizing the received frame in response to recognizing
the frame synchronization bytes.

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19. The method of claim 18 further comprising:
selecting the values of the frame synchronization bytes in the
overhead section of the received frames; and
wherein synchronizing the received frames in response to
10 recognizing the frame synchronization bytes includes synchronizing
received frames in response to recognizing the synchronization byte
values in the received frames.

20. The method of claim 19 wherein selecting the frame
15 synchronization byte values in the received frame includes selecting a
first frame synchronization byte value; and
wherein synchronizing the received frame in response to
recognizing the frame synchronization bytes includes synchronizing the
received frame in response to recognizing the first frame synchronization
20 byte value.

21. The method of claim 19 further comprising:
selecting the number of consecutive frames with recognized
frame synchronization bytes; and
25 wherein synchronizing the received frame in response to
recognizing the frame synchronization bytes includes synchronizing the

received frame in response recognizing the selected frame synchronization byte values in the selected number of consecutive frames.

22. The method of claim 19 further comprising:
5 selecting the location of the frame synchronization byte values in a transmitted frame.

23. The method of claim 22 further comprising:
10 selecting the location of frame synchronization byte values in the received frame.

24. The method of claim 23 wherein selecting the location of the frame synchronization byte values in a transmitted frame includes selecting first locations for a first byte value, and second locations for a
15 second byte value; and

wherein synchronizing the received frame in response to recognizing the frame synchronization bytes includes synchronizing the received frame in response to recognizing the first frame synchronization byte values in the first locations and the second byte values in the second
20 locations.

25. The method of claim 23 wherein selecting the location of frame synchronization byte values in the overhead section of a transmitted frame includes selecting first frame synchronization byte
25 values in first locations; and

wherein selecting the location of the bytes to be used for frame synchronization of the received frame includes selecting the first frame synchronization byte values in the first locations.

5 26. The method of claim 23 wherein selecting the locations of frame synchronization byte values in the overhead section of a transmitted frame includes selecting a first frame synchronization byte value in a first number of locations;

 wherein selecting the location of the frame synchronization
10 byte values in the received frame includes selecting the first frame synchronization byte value in a second number of locations, less than the first number; and

 wherein synchronizing the received frame in response to recognizing the frame synchronization bytes includes synchronizing the
15 received frame in response to recognizing the first frame synchronization byte value in the second number of locations.

 27. The method of claim 19 further comprising:
 selecting the bit error rate of the frame synchronization byte
20 values.

 28. The method of claim 27 wherein selecting a bit error rate includes selecting an average bit error rate for the selected frame synchronization byte values.

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29. The method of claim 27 wherein synchronizing the received frame in response to recognizing the frame synchronization byte values includes recognizing frame synchronization byte values having a bit error rate less than, or equal to, the selected frame synchronization bit error rates.

30. The method of claim 19 further comprising:
defining a superframe structure with a predetermined number of frames per superframe; and
wherein selecting the values of frame synchronization bytes in the overhead section of a transmitted frame includes selecting byte values to be used for synchronization in the overhead section of each frame of the superframe;
wherein sending the frame includes sending frames in the superframe structure; and
wherein synchronizing the received frame in response to recognizing the frame synchronization bytes includes recognizing frame synchronization byte values in each frame of the superframe.

31. The method of claim 30 further comprising:
selecting the quantity of frame synchronization byte values in the overhead section of the received frame.

32. The method of claim 31 wherein selecting the quantity of frame synchronization byte values in a received frame includes selecting a quantity of byte values for each frame of the superframe; and

wherein synchronizing the received frame in response to recognizing the frame synchronization bytes includes recognizing the selected quantity of frame synchronization byte values in each frame of the superframe.

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33. The method of claim 32 wherein selecting the quantity of frame synchronization byte values includes selecting a first number of frame synchronization byte values in a first frame; and

wherein synchronizing the received frame in response to
10 recognizing frame synchronization bytes includes recognizing the first number of frame synchronization byte values in the first frame.

34. The method of claim 32 wherein selecting the quantity of each frame synchronization byte values in the received frame includes
15 selecting a first number of frame synchronization bytes having a first value, and a second number of frame synchronization bytes having a second value; and

wherein synchronizing the received frame in response to recognizing the frame synchronization bytes includes synchronizing the
20 received frame in response to recognizing the first number of frame synchronization bytes having the first value, and the second number of frame synchronization bytes having the second value.

35. The method of claim 32 further comprising:
25 selecting the quantity of frame synchronization bytes in the overhead section of a transmitted frame.

36. The method of claim 35 wherein selecting the quantity of the frame synchronization byte values in the transmitted frame includes selecting a first number of frame synchronization bytes having a first value, and a second number of frame synchronization bytes having a second value;

wherein selecting the quantity of frame synchronization bytes in the received frame includes selecting a third number of frame synchronization bytes, less than the first number, having the first value, and a fourth number of frame synchronization bytes, less than the second number, having the second value; and

wherein synchronizing the received frame in response to recognizing the frame synchronization bytes includes synchronizing the received frame in response to recognizing the third number of frame synchronization bytes having the first value, and the fourth number of frame synchronization bytes having the second value.

37. The method of claim 19 further comprising:
selecting a number of consecutive received frames in which frame synchronization bytes values are not recognized; and
falling out of synchronization in response to not recognizing frame synchronization bytes values in the selected number of received frames.

38. In a multidimensional digital frame structure, a transmitter system for variably programming the value of frame synchronization bytes, the system comprising:

a frame generator including an overhead generator to
5 generate the overhead section of a frame, a payload generator to generate the payload section of the frame, and an encoder to provide forward error correction (FEC) for the frame; and

wherein the overhead generator includes an input to select the value of frame synchronization bytes in the overhead section.

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39. The system of claim 38 wherein the frame generator supplies a frame with a first plurality of overhead bytes; and

wherein the overhead generator accepts commands to select frame synchronization byte values in the range from zero to the first
15 plurality, for each frame.

40. The system of claim 39 wherein the overhead generator selects a second plurality of bits for each frame synchronization byte value, where each byte includes the second plurality of bits.

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41. The system of claim 40 wherein the overhead generator selects frame synchronization byte values from a plurality of byte values.

42. The system of claim 38 wherein the frame generator forms a superframe structure with a predetermined number of frames per superframe; and

wherein the overhead generator selects frame
5 synchronization byte values for the overhead section of each frame of the superframe.

43. The system of claim 42 wherein the overhead
generator selects a quantity of frame synchronization bytes values in the
10 overhead section.

44. The system of claim 43 wherein the frame generator forms a superframe with a first and a second frame; and

wherein the overhead generator supplies a first number of
15 selected frame synchronization byte values for the first frame and a second number of frame synchronization byte values for the second frame.

45. The system of claim 38 wherein the overhead
generator selects the location of frame synchronization byte values in the
20 overhead section.

46. The system of claim 45 wherein the overhead
generator selects first frame synchronization byte values in a first
location, and second frame synchronization byte values in a second
25 location.

47. In a multidimensional digital frame structure, a receiver system for variably programming the value of frame synchronization bytes, the system comprising:

a frame receiver including an overhead receiver to receive
5 the overhead section of a frame, a payload receiver to receive the payload section of the frame, and a decoder to provide a forward error corrected (FEC) frame; and

wherein the overhead receiver includes an input to select the value of frame synchronization bytes in the overhead section.

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48. The system of claim 47 wherein the overhead receiver selects a second plurality of bits for each frame synchronization byte value, where each byte includes a second plurality of bits.

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49. The system of claim 48 wherein the overhead receiver selects frame synchronization byte values from a plurality of byte values.

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50. The system of claim 49 wherein the frame receiver supplies a frame with a first plurality of overhead section bytes; and
wherein the overhead receiver selects frame synchronization
byte values, in each frame, in the range from zero to a first plurality of
byte values.

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51. The system of claim 50 wherein the overhead receiver selects first frame synchronization bytes having a first value, and second frame synchronization bytes having a second value.

52. The system of claim 47 wherein the frame receiver
supplies a frame with a first plurality of overhead section bytes; and
wherein the overhead receiver accepts commands to select
5 frame synchronization byte values in the range from zero to the first
plurality.

53. The system of claim 47 wherein the frame receiver
forms a superframe structure with a predetermined number of frames per
10 superframe; and

wherein the overhead receiver selects the values of frame
synchronization bytes required for the recognition of a received frame
from the overhead section of each frame of the superframe.

54. The system of claim 53 wherein the overhead receiver
15 selects the quantity of frame synchronization bytes in the overhead
section.

55. The system of claim 54 wherein the frame receiver
20 forms a superframe with a first and a second frame; and
wherein the overhead receiver selects first frame
synchronization byte values in the first frame and second frame
synchronization byte values in the second frame.

56. The system of claim 47 wherein the overhead receiver selects the bit error rate required for the recognition of each selected frame synchronization byte value.

5 57. The system of claim 56 wherein the overhead receiver selects an average bit error rate for the selected frame synchronization byte values.

58. The system of claim 47 wherein the overhead receiver
10 selects locations for the frame synchronization byte values.

59. The system of claim 58 wherein the overhead receiver selects first byte locations for first frame synchronization byte values.

15 60. The system of claim 59 wherein the overhead receiver accepts commands to select a first number of byte locations for a first number of frame synchronization byte values in a first frame, and a second number of byte locations for a second number of frame synchronization byte values in a second frame.

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61. The system of claim 47 wherein the overhead receiver selects a number of consecutive frames in which frame synchronization byte values must be recognized for the received frames to be synchronized.

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62. The system of claim 47 wherein the overhead receiver selects a number of consecutive frames in which frame synchronization byte values are not recognized for the received frames to fall out of synchronization.

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63. A system for variably programming the value of frame synchronization bytes in the communication of a multidimensional digital frame structure, the system comprising:

a transmitter with a frame generator including an overhead
10 generator having an input to accept commands for selecting the value of frame synchronization bytes in the overhead section of a transmitted frame; and

a receiver with a frame receiver including an overhead
receiver having an input to accept commands for selecting the value of
15 frame synchronization bytes required for synchronizing the received frame, the overhead receiver synchronizing the frame in response to recognizing the frame synchronization byte values.